

Modeling Intervals in P1788

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Abstract

In the forthcoming IEEE P1788 standard the interval concept is very general. Based on the classical Moore intervals (closed, connected, bounded sets of real numbers) semantically different flavours can be considered. The current draft [1] that will be under public ballot during the time of the meeting features the flavour of set based intervals which are all closed, connected and not necessarily bounded subsets of the reals. Different flavours like containment sets [2] or Kaucher intervals [3] may be considered but are not detailed in the current draft.

Following the definition of IEEE 754 floating point arithmetic [4] intervals are specified by a leveled structure. This talk shows the relationship between that approach and the commonly used abstract data type model known from computer science. We then give an object oriented specification that is the foundation of our reference implementation [5].

The complexity of intervals is further increased by the definition of decorated intervals. These are intervals which carry information on its evaluation history. Such a feature is very important for the computation of rigorous mathematical statements like the application of fixpoint theorems, which are only correct if the called function is continuous all over its argument.

References

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